Space Weather Technical Forecast

Issued on Saturday, 13 November 2021 at 00:18 Local

This technical forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: No significant activity.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar Activity was Very Low through the UTC day of Friday 12 November, with no significant X-ray flares and a stable background trace recorded at GOES 16 near the A/B flux boundary. There are currently three numbered sunspot regions on the visible disc. The main change was evident in AR2894, which developed a trailing spot into the UTC evening to be re-classified as a bipolar Cso/Beta group, culminating in a long-period B6.5 at 2301UTC, although at the time of writing there was no obvious ejecta from this event. The reverse growth trend occurred in AR2895, which shrank to a unipolar Axx, while AR2893 became difficult to analyse on the western limb, but visually approximated an Hax Alpha.

There are numerous small filaments scattered across the disc at present, however none were seen to move in the period. No Earth-directed CMEs were observed in available coronagraph imagery.

Solar Wind / Geomagnetic Activity: The solar wind, as measured at L1 by DSCOVR was characteristic of a slow regime, with a gradual decline in the solar wind speed recorded from 400 to 340km/s. The solar wind density ranged within typical values in mid single figures ppcc, while the IMF was unremarkable with a peak of 7nT and stable trend. The north-south component of the IMF, Bz was mainly co-aligned with the Earth's field through the period, peaking at +6nT, with a brief foray to reach a negative value of -3nT early on. The phi angle was negative (towards the sun).

The net result of these solar wind measures was for provisionally Quiet Kp indices throughout, peaking at Kp 2o in the 03-06UTC interval.

Energetic Particles / Solar Radiation: The high energy proton flux (greater than 10 MeV) as measured by GOES-16, remained at Background. The high energy electron flux (greater than 2 MeV) showed a diurnal oscillation between Moderate and Normal Background flux, peaking at 895pfu at 12/1515UTC. The 24-hour integrated fluence has remained below the Active threshold (1.0e8 integrated pfu) with a 13/0000 UTC observation of 3.47e7 integrated pfu.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is expected to be Very Low, with only a daily Slight Chance of C-class flares from the three active regions currently on the disc.

Solar Wind / Geomagnetic Activity: There are no Earth-directed CMEs in the forecast.

The solar wind speed is expected to mainly be at Background, with any enhancements from the arrival of coronal hole fast wind expected to be limited, and probably confined to day one, Saturday 13 November, if present. Geomagnetic activity is expected to be mostly Quiet, with a

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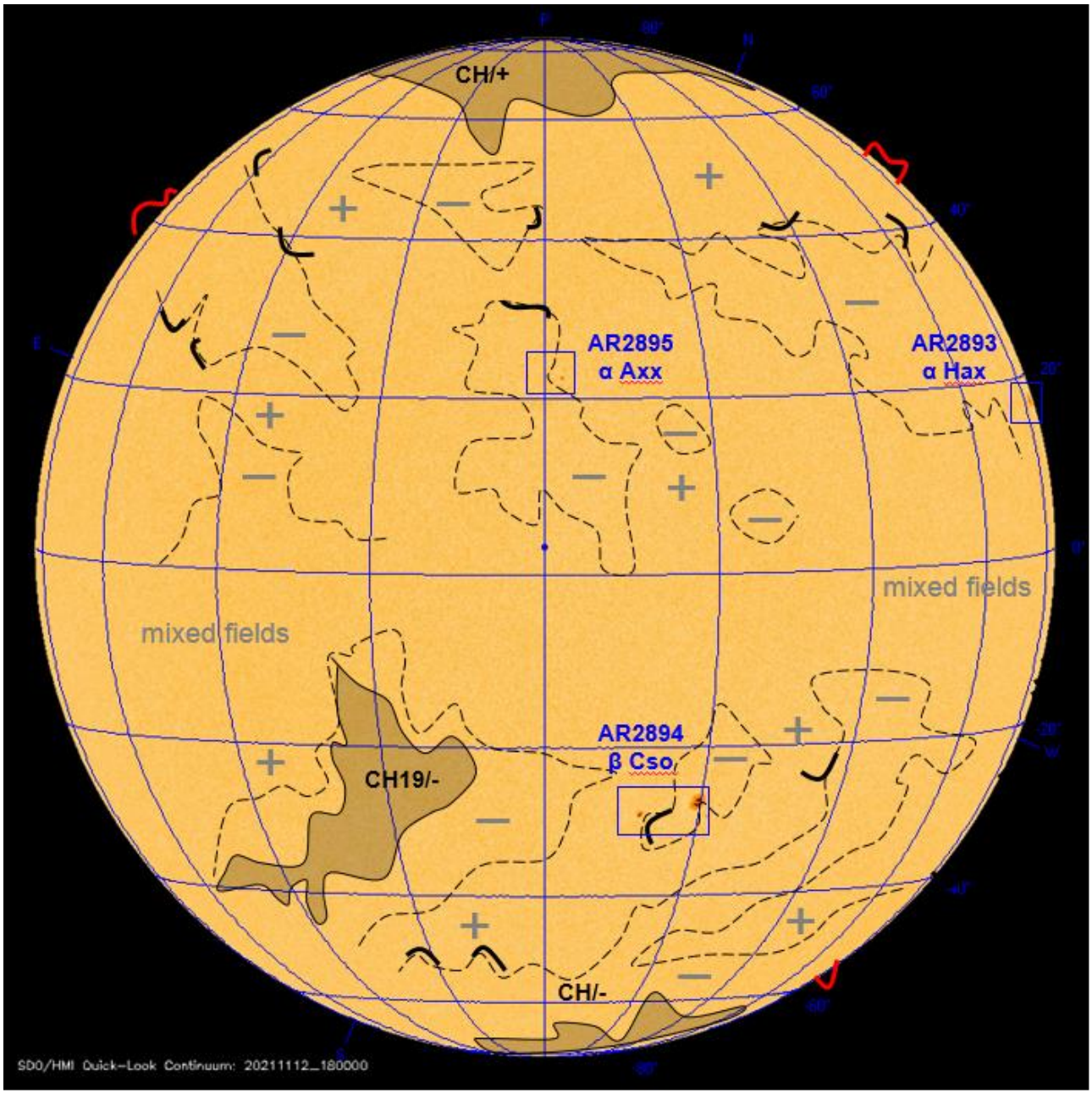
chance of Unsettled (Kp 0-3) peaking on Saturday.

Energetic Particles / Solar Radiation: The high energy (greater than 10 MeV) proton flux is expected to be at or near Background levels. The high energy electron flux (greater than 2 MeV) is expected to be mainly at Moderate to Normal Background levels. The corresponding 24-hour electron fluence is expected to remain below the Active level (1e8 integrated pfu).

Figure 1. Solar Analysis Valid 12/1800UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms:

There are no Earth-directed CMEs that feature in the forecast.

Solar winds are currently at background and declining. A small coronal hole in the southwest disc is no longer visible on recent imagery, with any associated fast wind most likely arriving inside the coming 24 hours, but not expected to bring notable enhancement to geomagnetism. The next notable fast winds enhancement is likely to be from coronal hole 19, which is expected to lie beyond the scope of this forecast period.

Geomagnetic activity is expected to be mostly Quiet, with a chance of Unsettled intervals peaking due to any slight enhancement from the arrival of weak coronal hole-sourced fast wind within day one (Saturday 13 November).

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	1	1	1	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity - Earthbound Coronal Mass Ejections

Nil.

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Radio Blackouts - X-Ray Flares:

Solar Activity is currently Very Low, with only three small and simple sunspot containing active regions, one of which (AR2893) will shortly rotate onto the sun's far side. Barring development of new regions, this is the only departing spot expected in the four days. In terms of arriving groups, there are some suggestions that the Carrington locations for Ex-2890 and Ex-2886 lie narrowly over the southeastern limb and still manifest as bright flux regions in STEREO A EUVI 195 imagery, however their contribution will be assessed once they show themselves for analysis.

There is considered a daily Slight Chance of C-class flares throughout the period, largely the result of the small bipolar AR2894 near centre-disc.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	2	2	2	2
Very Active	R3 to R5 X Class	No	1	1	1	1

Figure 2: Development of AR2894 over the 24-hour period, as shown in HMIIF imagery.

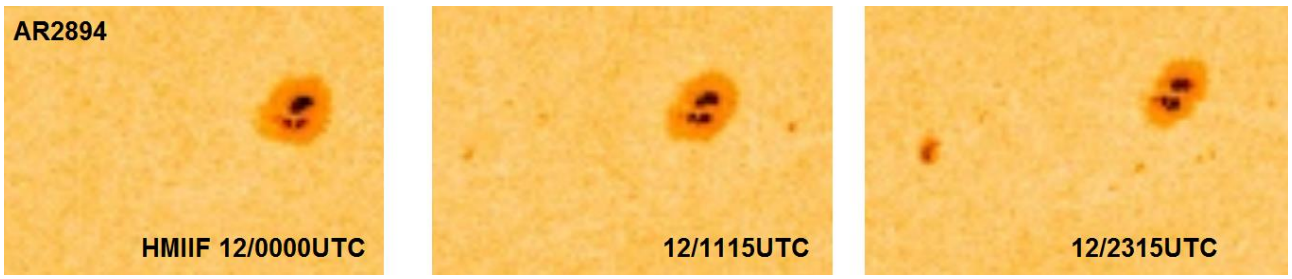
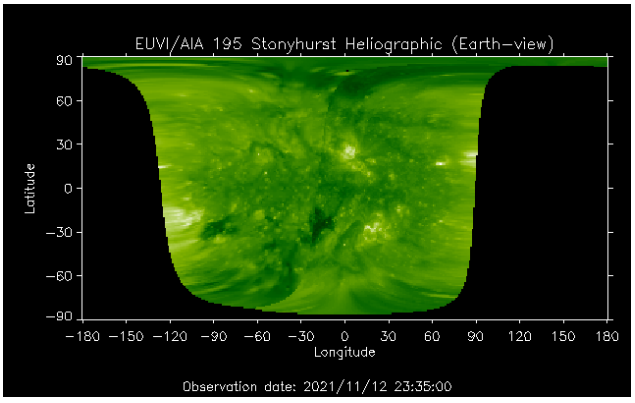


Figure 3: Cylindrical projection of the whole sun in 195 Angstroms, showing a bright flux region narrowly over the southeastern limb. This area may factor into X-ray flare probabilties into the new working week.



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Solar Radiation Storms - (High Energy Protons):

The high energy proton flux (greater than 10 MeV) as measured by GOES-16, remained at Background during the previous 24 hours, and is currently forecast to remain at this level through the period.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	1	1	1	1
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

High Energy Electrons Event (≥ 2MeV):

The high energy electron flux (greater than 2 MeV) as measured by GOES-16 at GEO is currently Normal Background to Moderate, with peak values gradually declining since the recent enhancements but still with a chance of briefly reaching high (greater than 1000 pfu). No notable sources of further enhancement are anticipated through the period, with a chance of some drop out in values from the arrival of a weak coronal hole-sourced fast wind.

The associated 24-hour electron fluence is expected to remain below the Active (1e8 integrated pfu) threshold, with a gradual declining trend. REFM is currently giving good guidance.

GEO Electron Environment Probability (Exceedance)	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ 2 MeV ≥ $1x10^8$**	No	1	1	1	1
Very Active	**≥ 2 MeV ≥ $1x10^9$**	No	1	1	1	1

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